

## PERSONAL DIGITAL ASSISTANT VEHICLE INTERFACE AND METHOD

### FIELD OF THE INVENTION

The invention relates to portable computers. The invention also  
5 relates to personal digital assistants and event notifications.

### BACKGROUND OF THE INVENTION

Personal digital assistants are known in the art. A personal digital assistant is portable, typically hand held, computer having a microprocessor, a memory defining a database, and an input/output device such as a touchscreen 10 or a screen and a keyboard. The database is typically for storing calendar or scheduling information and for storing contact information such as names, addresses, e-mail addresses, phone numbers, and associated information. PDAs include, for example, the Palm (TM) or Palm Pilot (TM) available from Palm Inc., 5470 Great America Parkway, Santa Clara, California, USA 95052, as well as 15 devices that use versions of the Windows (TM) CE operating system or variations thereon, personal information managers, organizers, and other computers smaller than notebook computers. Some such devices, such as the Palm VII (TM) have wireless modems and provide wireless access to e-mail and certain web sites. Some Internet web sites are developed for such devices and 20 provide simplified content and navigation. Some mobile phones, including those with the EPOC (TM) operating system, can be considered to be PDAs.

Such a device typically has an output, such as a serial output, which can be used for coupling the device to a docking station or cradle or to some other peripheral equipment such as a mouse, modem, camera or other imaging 25 device, etc. Alternatively, the device or cradle can include an optical (e.g. infrared) input/output capability.

SUMMARY OF THE INVENTION

The invention provides a PDA-vehicle interface for use with a personal digital assistant of the type including a memory defining a database, a microprocessor coupled to the memory, an input/output device coupled to the microprocessor, and an output port coupled to the microprocessor. The personal digital assistant is configured to provide data to the output port indicating a predetermined event has occurred in response to occurrence of the predetermined event. The interface includes actuator circuitry including a digital to analog converter having a digital input coupled to the output port, having an analog output, and being configured to provide an analog signal in response to the data being applied to the digital input. In one aspect of the invention, the data is serial data. The analog output is configured to be coupled to an electrically actuated vehicle component that, when actuated, is audible or visible. The actuator circuitry is configured to effect actuation of the vehicle component in response to the data being provided to the digital input of the digital to analog converter.

Another aspect of the invention provides a method comprising providing a personal digital assistant including a memory defining a database, a microprocessor coupled to the memory, an input/output device coupled to the microprocessor, and an output port coupled to the microprocessor. The personal digital assistant is configured to provide data to the output port indicating a predetermined event has occurred in response to occurrence of the predetermined event. Digital data at the output port is converted to an analog signal to provide an analog signal in response to occurrence of the predetermined event. The analog signal is used to actuate an electrically actuated vehicle component that, when actuated, is audible or visible, such that actuation of the vehicle component is effected in response to occurrence of the predetermined event.

In one aspect of the invention, the vehicle component is a horn.  
30 In another aspect of the invention, the vehicle component is a light.  
In another aspect of the invention, the personal digital assistant

includes a rechargeable battery, and the battery of the personal digital assistant is charged using power from the vehicle.

#### DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram illustrating a system in accordance with one embodiment of the present invention.

Fig. 2 is a perspective view of a personal digital assistant, in accordance with an embodiment of the present invention.

Fig. 3 is a top view of the personal digital assistant of Fig. 2.

Fig. 4 is a perspective view of a PDA-vehicle interface, in accordance with one embodiment of the invention.

Fig. 5 is a partial plan view of a vehicle coupled to the system of Fig. 1.

#### DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 shows a system 10 in accordance with one aspect of the invention. The system 10 includes a personal digital assistant (PDA) 12.

The personal digital assistant 12 is a portable, hand held, computer having a memory 14 defining a database 16, a microprocessor 18 coupled to the memory 14 (or itself including the memory 14) and configured to act on the database 16, an input/output device 20 (see also Fig. 2), such as a touchscreen or a screen and a keyboard, coupled to the microprocessor 18, and an output port 22 (see also Figs. 2 and 3) coupled to the microprocessor 18. In the illustrated embodiment, the output port 22 is a serial output port. It should be understood that personal digital assistant could include other data ports such as a parallel port, an optical port, infrared port, a10BaseT port, or any combination of such data ports.

The database 16 is arranged to store calendar or scheduling information. For example, different planned activities/appointments can be entered, using the input/output device 20, for specific times (or time ranges) on specific dates (or date ranges) and an alarm event will occur a predetermined

amount of time before the scheduled activity, to remind the user of the personal digital assistant 12 that the time for the activity is approaching. The database 16 also includes fields for storing contact information such as names, addresses, e-mail addresses, phone numbers, and associated information, as is known in the art.

The personal digital assistant 12 can be similar to, for example, the Palm (TM) or Palm Pilot (TM) available from Palm Inc., 5470 Great America Parkway, Santa Clara, California, USA 95052. Alternatively, the personal digital assistant 12 can be similar to other existing devices that use the Windows (TM) 10 CE operating system or variations of the Windows (TM) CE operating system.

In the illustrated embodiment, the personal digital assistant 12 has a modem 24, coupled to the microprocessor 18. The modem 24 is capable of wireless communications (using a mobile telephone network, such as a cell phone network, for example) and provides wireless access to e-mail and certain 15 web sites. Some Internet web sites are developed for such devices and provide simplified content and navigation.

In one embodiment, the personal digital assistant 12 includes mobile phone circuitry 26, including ringer circuitry 28 configured to provide a signal to actuate ringing when a phone call initiation attempt is being received. The 20 mobile phone circuitry 26 is used by the modem 24. The personal digital assistant further includes an antenna 23 (see Figs. 2 and 3) coupled to the mobile phone circuitry 26.

The personal digital assistant 12 further includes an e-mail client 25 (e.g., software included in the memory 14 that is executed by the 25 microprocessor 18), and is configured to provide data to the output port 22 indicating that an e-mail has been received in response to an e-mail being received. The e-mail is received via the wireless modem 24. In an alternative embodiment, e-mail can be received using a modem (not shown) that uses conventional telephone lines.

30 In one embodiment, the personal digital assistant 12 further includes a rechargeable battery (or batteries) 27 coupled to supply power to the

microprocessor 18, memory 14, I/O device 10, modem 24, mobile phone circuitry 26, and any other component of the personal digital assistant 12 that requires power. The personal digital assistant has a battery charger connector port 29 (see also Fig. 2), configured to be coupled to an output connector of a 5 battery charger.

The personal digital assistant 12 is configured to provide data to the output port 22 indicating a predetermined event (such as the above-described alarm event) has occurred in response to occurrence of the predetermined event. Besides a scheduling/appointment alarm, as described above, the predetermined 10 event can also be, for example, receipt of a new e-mail, ringer circuitry 28 indicating that the mobile phone 26 is ringing, etc. For example, the personal digital assistant 12 is configured to provide data to the output port 22 indicating that a phone call initiation attempt is being received, in response to the ringer circuitry 28 indicating that a phone call initiation attempt is being received. In 15 one embodiment, the personal digital assistant further includes a speaker (not shown) to produce a sound in response to the occurrence of such predetermined events.

The system 10 further includes actuator circuitry 30 including a digital to analog converter 32 having a digital input 34 coupled to the output port 22, 20 having an analog output 36, and being configured to provide an analog signal in response to the data being applied to the digital input 34.

In one embodiment, the actuator circuitry 30 is configured to effect a pattern of actuations (e.g. honk twice, pause, honk twice) in response to the data being provided to the digital input 34 of the digital to analog converter 32 25 or just a single actuation (e.g. one honk for one second). In another embodiment, the actuator circuitry 30 is configured to generate different patterns of actuations for different predetermined events to distinguish between different types of predetermined events (e.g. honk once for e-mail, honk twice in a row for an incoming phone call, or simulate a tune for phone call, etc.).

30 The analog output 36 is configured to be coupled via conductors 38 and 39 to an electrically actuated vehicle component 40 that, when actuated, is

audible or visible. The actuator circuitry 30 effects actuation of the vehicle component 40 in response to the data being provided to the digital input 34 of the digital to analog converter 32. In one embodiment, the actuator circuitry 30 effects actuation of the vehicle component 40 by providing power to the vehicle component 40. In another embodiment (not shown), the actuator circuitry 30 triggers or enables control circuitry (such as a relay or transistor) that controls the vehicle component 40.

The system 10 further includes a battery charger 42 having a power input plug connector 44 configured to be coupled to a vehicle battery 46, such as via a cigarette lighter power port 48 (shown in Fig. 5) or via a vehicle fusebox 62 (see Fig. 5), or coupled directly to the vehicle battery 46. The battery charger 42 has an output connector 50 which is selectively coupled to the battery charger input connector 29 of the personal digital assistant 12. The battery charger 42 includes charger circuitry 52, which is designed for use with the type of battery 27 included in the personal digital assistant 12. For example, different charging ramps and patterns would be implemented by the charger circuitry 52 if the battery 27 were a lithium ion battery versus a nickle metal hydride battery.

In one embodiment (see Fig. 4), the system 10 further comprises a common housing 54 supporting the digital to analog converter 32 and the battery charger 42. Other embodiments are possible.

Fig. 5 shows a portion of a vehicle 60. Though the vehicle shown is an automobile, the invention also has application to other vehicles, such as other types of land vehicles (e.g., trucks, jeeps, motorcycles, tractors, etc.) or to non-land vehicles (e.g., boats). The digital input 34 (see Fig. 4) and battery charger output 50 are coupled to the personal digital assistant 12, and the conductors 38 and 39 and plug 44 are coupled to the vehicle 60. More particularly, the plug 44 is selectively coupled to the cigarette lighter or power port 48 of the vehicle (or to the fusebox 62 or directly to the vehicle battery 46). The conductors 38 and 39 are coupled to circuitry for actuating the component 40, such as to a switch or to the fusebox 62 of the vehicle (e.g. with a connector

that is the same size and shape as a fuse, in which case an in-line fuse would be included in the conductor 38 or 39 or a fuse is provided in the housing 54).

In an alternative embodiment, a mobile phone, such as a cellular phone or GSM phone, is substituted for the personal digital assistant. The 5 mobile phone includes mobile phone circuitry similar to the circuitry 28, ringer circuitry similar to the ringer circuitry 28, and a rechargeable battery, and is coupled to an interface that effects actuation of an audible or visible vehicle component in response to the ringer circuitry indicating that a phone call is being received. In one embodiment, this vehicle-phone interface further includes a 10 battery charger having a connector configured to mate with a battery charger input connector of the phone, for charging the phone from the vehicle (e.g. the vehicle-phone interface includes a connector for use with a vehicle's cigarette lighter/power port, or a connector for coupling to a power output in the vehicle fusebox, etc.).

15 Thus, an interface has been provided that allows a user of a personal digital assistant to leave their personal digital assistant in their vehicle when they are away from but nearby the vehicle, and still be informed of event notifications. For example, a horn will honk, or a headlight will flash, when the personal digital assistant would normally beep via a speaker. This can be very 20 useful if, for example, the user of the personal digital assistant wishes to charge the batteries of the personal digital assistant using power from the vehicle, yet still wishes to receive notifications.

25 The protection sought is not to be limited to the disclosed embodiments, which are given by way of example only, but instead is to be limited only by the scope of the appended claims.